

Clinical-Epidemiological Approach To Patients With Chronic Degenerative Diseases Who Underwent Retinal Fluorescein Angiography

Josefa Bell Castillo^{1*}, Harold Enmanuel Leon Barrera², Janeth Higuera Gudiño³, Jorge Rondón Labrada⁴, María de Jesus George Bell⁵, Wilberto George Carrión⁶

¹PhD in Pedagogical Sciences. Specialist in Internal Medicine

²General Nurse

³General Nurse

⁴First Degree Specialist in Orthopedics and Traumatology. Medical assistant

⁵First Degree Specialist in General Surgery, Medical assistant

⁶Doctor of Pedagogical Sciences. Specialist in Internal Medicine, Associate Professor

*Correspondence Author:

Josefa Bell Castillo, PhD in Pedagogical Sciences. Specialist in Internal Medicine. ORCID: <http://orcid.org/0000-0001-6059-1314>

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Abstract

Background: Chronic degenerative diseases compromise ocular health, increasing the need for multidisciplinary clinical care and highlighting the diagnostic value of retinal fluorescein angiography as an advanced ophthalmological procedure. This study aimed to describe the clinical-epidemiological approach to patients with chronic degenerative diseases who underwent retinal fluorescein angiography.

Methods: An observational, descriptive, and retrospective study was conducted in a sample of 78 patients with chronic degenerative diseases who underwent retinal fluorescein angiography at an ophthalmological Clinic in Mexico City between January 1, 2024, and August 31, 2025. Variables were analyzed using descriptive statistics, including percentages, comparison of proportions, and validation of results.

Results: female patients predominated (65.38%) with the 51-60 year age group being the most represented. The most frequent comorbidities were diabetes mellitus and systemic arterial hypertension, associated with three ophthalmological diagnoses. Stage 2 hypertension was identified in 26.92% of participants. Overweight was the most prevalent risk factor (47.43%), and capillary glucose levels between 131 mg/dL and 179 mg/dL were observed most frequently.

Conclusions: The clinical-epidemiological approach to patients with chronic degenerative diseases undergoing retinal fluorescein angiography demonstrates the importance of multidisciplinary medical care in patients with multiple comorbidities and metabolic syndrome. Adequate control of systemic diseases and associated risk factors may contribute to reducing ocular complications and improving patient outcomes.

Keywords: Clinical-Epidemiological Approach, Chronic Degenerative Diseases, Diabetes Mellitus, Systemic Hypertension, Retinal Fluorescein Angiography, Ophthalmological Diseases.

Introduction

Eye diseases have been documented since ancient times. Early descriptions were found in the Ebers Papyrus, an ancient Egyptian medical manuscript dating back to approximately 1500 BCE.

Over time, ophthalmological diseases have increased in prevalence. Their complex etiology, epidemiological patterns, and associated complications have contributed to the development of multiples scientific theories, wich have envolved alongside advances in medicine and technology.^{1,2}

Initially, ophthalmology was practiced as part of general medicine .However, subsequent reforms and scientific advances promoted the especialization of this field ,leading to the development of ophthalmological schools, specialized clinics, and hospital- based care models. The growing health, economic, and psychosocial impact of eye diseases has further driven innovation and improvements in ophthalmological practice.^{3,4}

Currently, the management of patients with ophthalmological disorder is structured around multidisciplinary care, as e significant proportion of these patients present with chronic degenerative diseases. Therefore, ophthalmology, as a surgical specialty, requires collaboration with other medical disciplines to ensure comprehensive treatment, coordinated teamwork, and improved patient outcomes.^{4,5}

The collaboration between ophthalmologists and specialists in internal medicine is particularly important because timely evaluation and management of systemic diseases contribute to accurate diagnosis and prevention of complications in patients with chronic degenerative conditions.

Eye health may be affected by several chronic diseases, particularly those involvin vascular and metabolic alterations .Therefore, adecuade control of systemic conditions is essential for preserving long-term complications^{5,6,7}.

Retinal fluorescein angiography is a specialized and effective ophthalmological imaging technique that plays a fundamental role in the diagnosis and monitoring of retinal diseases.

This procedures allows detailed evaluation of retinal and choroidal circulation, facilitating the detection of vascular abnormalities and pathological changes that may compromise visión.

Fluorescein angiography contributes to early diagnosis and appropriate treatment planning by providing valuable information regarding retinal vascular integrity. Consequently, especialized diagnostic expertise and multidisciplinary clinical management are required to ensure comprehensive and high -quality patient care^{8,9}.

The increasing prevalence of chronic degenerative diseases, including diabetes mellitus, systemic hypertension, chronic

kidney disease and metabolic disorder, represents a major challenge for healthcare systems. These conditions may produced progressive vascular and neurological damage, affecting highly vascularized organs suchs as the retina^{10,11}.

Therefore the clinical-epidemiological evaluation of patients with chronic degenerative diseases undergoing retinal fluo-rescein angiography is essential to identify risk factors, optimize medical management and prevent visual impairment.

This study aimed to describe the clinical-epidemiological charasteric of patients with chronic degenerative diseases who underwent retinal fluorescein angiography in an ophthalmological center, emphasizing the importance of multidisciplinary care in reducing risks and complications.

Methods

Study desing and setting

An observational, descriptive, and retrospective study was conducted among patients with chronic degenerative diseases who underwent retinal fluorescein angiography at an oftalmological clinic in Mexico City The study period extended from January 1, 2024, to August 31, 2025.

A total of 78 patient were included in the study. The objective was to decribe the clinical-epidemiological characteristic of patients with chronic degenerative diseases undergoing retinal fluorescein angiography and to identify associated clinical and metabolic risk factors.

Study population and selection criteria

Patients were selected according to the following inclusión criteria:

- Adults older than 18 years of age.
- Patients of both sexes.
- Previous diagnosis of chronic degenerative diseases
- Availability of clinical information recorded in medical records, including: personal medical history, blood pressure measurements, capillary blood glucose at the time of the procedure, body mass index (BMI). Ophthalmological diagnoses and laboratory test results.
- Patients with incomplete clinical information were excluded from the analysis.

Variables and operational definitions

Blood pressure classification

Hypertensive patients were classified according to the 2025 American Heart Association (AHA) criteria:

Normal blood pressure: < 120/80 mmHg.

Elevated blood pressure: systolic pressure between 120-129 mmHg and diastolic pressure < 80 mmHg.

Stage 1 hypertension: 130-139 mmHg systolic or 80-89 mmHg diastolic

Stage 2 hypertension: ≥ 140/90 mmHg.

Hypertensive crisis: > 180/120 mmHg.

Patients presenting with hypertensive crisis during the procedure were deferred and subsequently evaluated for medication adjustment.

Capillary blood glucose classification

Capillary blood glucose levels measurements at the time of retinal fluorescein angiography were classified according to references values from the American Diabetes Association (ADA) and World Health Organization (WHO):

- Normal fasting glucose: 70- 130 mg/dL
- Hypoglycemia: < 70 mg/dL
- Hyperglycemia: 131- 179 mg/dL
- Marked Hyperglycemia: ≥ 180 mg/dL

According to the institutional protocol, patients with glucose values ≥180 mg/dL were not submitted to the procedure and received medical recommendations for treatment adjustment.

No cases of hypoglycemia were reported during the study period.

Ophthalmological diagnoses

Ophthalmological conditions were classified according to the World Health Organization and Classification of Diseases (WHO-ICD), including:

- Refractive disorders: Myopia, Hyperopia, Astigmatism, and Presbyopia
- Cornea and Lens disorders: Cataracts. Keratitis. Keratoconus
- Retinal and Optic Nerve disorders: Retinal Detachment. Diabetic Retinopathy. Age-Related Macular Degeneration (AMD) and Glaucoma
- Inflammatory and Systemic ocular diseases: Conjunctivitis. Uveitis. Dry Eye

Because several patients studied presented with multiple ophthalmological conditions. They were categorized according to the number of diagnoses.

Two Diagnoses

Three Diagnoses. And four or more diagnoses

Anthropometric and laboratory evaluation:

Body mass index (BMI) was calculated, to identify nutritional risk factors according to the World Health Organization WHO criteria:

Normal weight: BMI 18.5- 24.9 kg / m²

Overweight: BMI 25- 29.9 kg / m²

Obese: BMI ≥30 kg / m²

Laboratory parameters included glucose, total cholesterol levels, triglycerides, creatinine, uric acid, and other biochemical markers.

Chronic kidney disease (CKD) was classified according to the kidney disease: Improving Global Outcomes (KDIGO) 2024 Guidelines based on estimated glomerular filtration rate (GFR)

Stage 1: GFR ≥ 90 ml/min.

Stage 2: GFR 60 - 89 ml/min.

Stage 3: GFR 30 - 59 ml/min.

Stage 4: GFR 15 - 29 ml/min.

Stage 5 GFR < 15 ml/min.

No patients with Stage 5 CKD were identified

Information obtained from medical records was entered into a database for statistical analysis. Descriptive statistics were performed using frequencies and percentages.

Comparisons between proportions were conducted using statistical test for validation of results, Data were presented using tables and graphs.

Ethical considerations: The study was approved by the Institutional Ethics Committee. Patient confidentiality and protection of personal information were maintained throughout the research process.

Results

A total of 78 patients with chronic degenerative diseases who underwent retinal fluorescein angiography were included in the study.

Female patients predominated, accounting for 51 cases (65.38%), while male patients represented 27 cases (34.61%). The most frequent age group was 51-60 years with 29 patients (37.17%). Younger patients showed the lowest frequency of presentation (Table 1).

Table 1: Distribution of patients with chronic degenerative diseases undergo retinal fluorescein angiography according to age and sex. Eye Diseases Clinic, Mexico city, January 2024-August 2025.

Age in years	Female		Male		Total	
	No.	%	No.	%	No.	%
Under 30	1	1.28	0	0	1	1.28
31-40	4	5.12	3	3.84	7	8.97
41-50	5	6.41	1	1.28	6	7.69
51 -60	17	21.7	12	15.38	29	37.17
61-70	16	20.51	6	7.69	22	28.20
71 and over	8	10.25	5	6.41	13	16.6
Total	51	65.38	27	34.61	78	100

Source: Medical records

The analysis of medical history and ophthalmological findings showed a high frequency of patients with multiple ocular diagnoses ,Three ophthalmological diagnoses were identified in (51.3%) of patients.

The most frequent comorbidity was the combination of diabetes mellitus and systemic hypertension, present in 35 patients (44.8%).Patients with diabetes mellitus alone represented 24.3%.while hypertension alone accounted 14.1% (Table 2).

Table 2: Distribution of patients according to personal medical history and number of ophthalmological diagnoses.

Personal medical history	Ophthalmological Diagnoses							
	Two diagnoses		Three diagnoses		Four or more diagnoses		Total	
	No.	%	No	%	No	%	No.	%
Diabetes mellitus + Hypertension	13	16.6	17	21.7	5	6.4	35	44.8
Diabetes mellitus	4	5.1	12	15.3	3	3.8	19	24.3
Systemic hypertension	3	3.8	7	8.9	1	1.3	11	14.1
No previous history	5	6.4	3	3.8	0	0	8	10.2
Other previous history	4	5.1	1	1.3	0	0	5	6.4
Total	29	37.2	40	51.3	9	11.5	78	100

Source: Medical records

Blood pressure measurements obtained before retinal fluorescein angiography, showed that only 33.33% of patients had normal values. Hypertension was frequently observed, particularly stage 2 hypertension, which affected 21 patients (26.92%).

Patients presenting hypertensive crises were not submitted to the procedure and were referred for medical reassessment and treatment adjustment (Table 3).

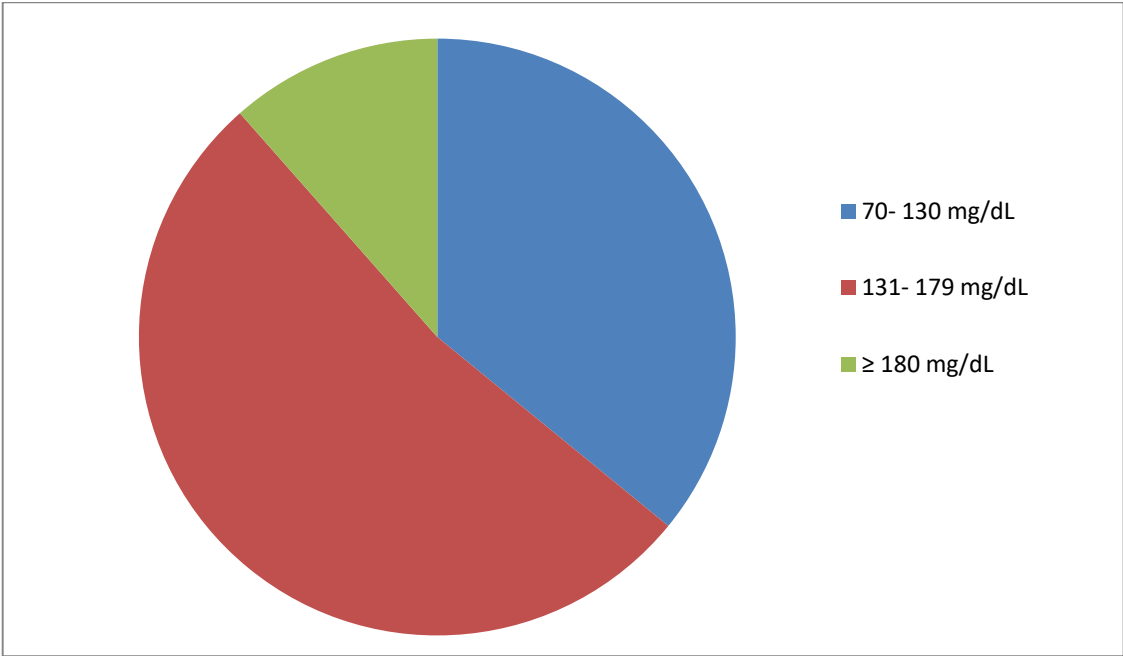
Table 3: Blood Pressure classification among patients undergoing retinal fluorescein angiography.

Blood Pressure category	Total	
	No	%
Normal	26	33.33
Elevated	10	12.82
Stage 1 Hypertension	19	24.35
Stage 2 Hypertension	21	26.92
Hypertensive Crisis	2	2.56
Total	78	100

Source: Medical records

Capillary glucose measurements demonstrated that the most frequent range was 131- 179 mg/dL, observed in 41 patients (52.56%). Normal glucose values (70- 130 mg/dL) were found in 28 patients (35.89%). Nine patients (11.5%) presented glucose value ≥ 180 mg/dL. According to institutional safety criteria, these patients were deferred, from undergoing retinal fluorescein angiography until metabolic control was improved.

Graph 1: Capillary glucose measurements



Source: Medical records

The evaluation of associated risk factors revealed that overweight was the most prevalent condition affecting 37 patients (47.43%), followed by hypercholesterolemia in 29 patients (37.17 %). Kidney disease was also observed, particularly stage 2 chronic kidney disease in 17 patients. (22.36%). (Table 5)

Table 5: Risk factors identified among the studied patients

Risk factors	Total	
	No	%
Overweight	37	47.43
Hypercholesterolemia	29	37.17
Stage 2 chronic kidney disease	17	22.36
Stage 1 chronic kidney disease	13	16.66
Hypertriglyceridemia	11	14.10
Obesity	10	12.82

Stage 3B chronic kidney disease	9	11.53
Mixed dyslipidemia	5	6.41
Stage 3A chronic kidney disease	5	6.41
Stage 4 chronic kidney disease	4	5.12
Total	78	100

Source: Medical records

Discussion

Chronic degenerative diseases, together with aging, represent important risk factors for ophthalmological complications, ranging from mild visual alterations to irreversible vision loss. Therefore, adequate diagnosis continuous monitoring, and appropriate management of these conditions are essential to prevent disease progression and preserve visual function^{12,13}.

In this study, females patients predominated, representing 65.38% of the sample, with the highest proportion observed in the 51-60 year age group (37.17%). Younger patients showed the lowest frequency of ophthalmological complications. These findings are consistent with previous studies reporting a higher frequency of retinal vascular alterations among women and individuals over 50 years of age undergoing fluorescein angiography.

A study conducted in Chile in 2025 reported that approximately half of fluorescein angiography procedures performed for diagnosis and follow-up were carried out in women older than 50 years¹⁴. Similar findings were reported in studies from León, Guanajuato and Puebla, Mexico, where older adults showed greater vulnerability to retinal disorders⁵.

According to the National Health Surveys in Mexico, including the National Health and Aging Survey (ENASEM) and the National Health and Nutrition Survey (ENSANUT), women present a high prevalence of chronic degenerative diseases. This situation may contribute to increased exposure to metabolic and vascular risk factors associated with ocular complications.^{21,22}

Chakravarthy U, Peto T, Martinez Escobar L, and Terrazas Rodriguez LD examined ocular disorders in patients with chronic diseases. They also identified the association of diabetes mellitus, hypertension, and advanced chronic kidney disease. This accurately summarizes the importance of a multidisciplinary approach in internal medicine and ophthalmology, highlighting how microvascular complications are severely interconnected within the body.

The present study identified a high frequency of patients with three ophthalmological diagnoses, particularly among individuals with diabetes mellitus and systemic hypertension. These comorbidity significantly increase the risk of cardiovascular, renal, and ocular complications because of their effects on vascular structures and target organs.

Diabetes mellitus and hypertension are not isolated health, rather their represented chronic conditions that interact and accelerate vascular damage. The retina, due to its extensive microvascular network and high metabolic demand, is particularly vulnerable to prolonged hyperglycemia and elevated blood pressure.¹⁵

Previous research has demonstrated that chronic hyperglycemia may induce oxidative stress, advanced glycation processes, and endothelial dysfunction, leading to retinal ischemia, macular edema and diabetic retinopathy.

These data corroborate with those of Muñoz Cornejo Arturo et al.

Likewise uncontrolled hypertension may contribute to retinal vascular injury, hypertensive retinopathy and optic nerve damage.

The findings of this study support the importance of evaluating metabolic parameters before retinal fluorescein angiography. The protocol implemented in the ophthalmological center, which postpones procedures in patients with severe hypertension or glucose levels ≥ 180 mg/dl, represents an appropriate safety measure to reduce potential complications.

The association between diabetes mellitus, hypertension, kidney disease, dyslipidemia and obesity observed in this population reflects the complexity of multimorbidity in patients requiring ophthalmological care. These conditions share common pathophysiological mechanisms involving inflammation, endothelial dysfunction, and microvascular damage.^{16,17,21}

Regarding risk factors, overweight was the most prevalent condition (47.43%), followed by hypercholesterolemia

(37.17 %) and stage 2 chronic kidney disease (22.36%). These findings emphasize the importance of comprehensive medical management aimed at controlling metabolic syndrome and preventing systemic and ocular complications. Previous studies have highlighted that age, diabetes mellitus, hypertension, obesity, dyslipidemia and kidney disease are associated with increased risk of retinal disorder, including diabetic retinopathy and age-related macular degeneration.

Although poor glycemic control is a recognized risk factor for retina damage, not all patients develop severe ocular complications, suggesting that individual genetic susceptibility and other biological factors may influence disease progression.^{11,14}

The identification of multiple comorbidities in patients undergoing retinal fluorescein angiography reinforces the need for multidisciplinary healthcare strategies involving ophthalmologists, internists, cardiologist, nephrologist, endocrinologists, and primary care providers.

Early detection, appropriate treatment adherence, and control of modifiable risk factors are essential components for reducing visual impairment and improving quality of life in patients with chronic degenerative diseases.^{19,20}

The findings of this study highlight the value of integrating ophthalmological evaluation with systemic disease management, particularly in populations with metabolic syndrome and multiple chronic condition.

Conclusions

The clinical-epidemiological approach to patients with chronic degenerative diseases undergoing retinal fluorescein angiography demonstrated a high prevalence of multimorbidity, particularly among women older 50 years with Diabetes mellitus and systemic arterial hypertension.

Patients frequently presented multiple ophthalmological diagnoses associated with cardiometabolic risk factors including overweight, dyslipidemia, and chronic kidney disease which may contribute to increased risk of visual complications.

These findings highlight the importance of multidisciplinary medical care involving ophthalmology and other clinical specialties to improve disease control, reduce complications and promote comprehensive patient management.

Adequate monitoring and control of chronic degenerative diseases, together with early identification of ocular alterations, are essential strategies for preserving visual health and improving quality of life.

Limitations of the study

This study was conducted in a single ophthalmological center and included a relative limited number of patients over a defined period. Therefore further multicenter studies with larger populations and longer follow-up periods

are recommended to confirm these findings and expand knowledge regarding the relationship between chronic degenerative diseases and retinal alterations.

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Conflict of interest

None declared

Ethical Approval: The study was approved by the Institutional Ethics Committee. Patient confidentiality and protection of personal information were maintained throughout the research process.

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